The Regional Nature of PM_{2.5} Episodes in Southwestern Pennsylvania



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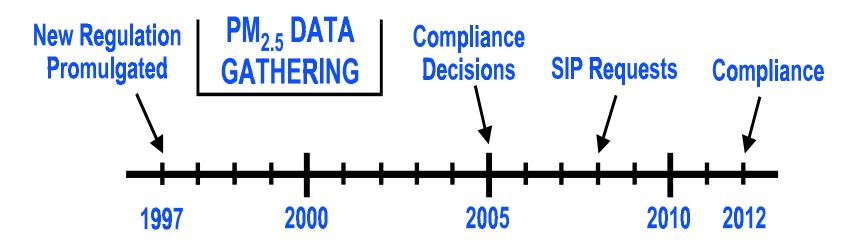
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PM_{2.5} Regulatory Process

- 1997 National Ambient Air Quality Standards (NAAQS) for PM_{2.5} based on "health effects"
 - -Mean annual concentration < 15 μg/m³
 - -Maximum concentration < 65µg/ m³







Why Is DOE Concerned About PM_{2.5}?

Goal 1 of Strategic Plan, DOE Office of Fossil Energy:

- "eliminate environmental issues as a barrier to fossil fuel production and use, while maintaining the availability and affordability of fossil fuels."

Coal is vital source of electricity

- -56% in U.S; 42% worldwide
- Reserves available for 200+ years
- Low cost to consumers

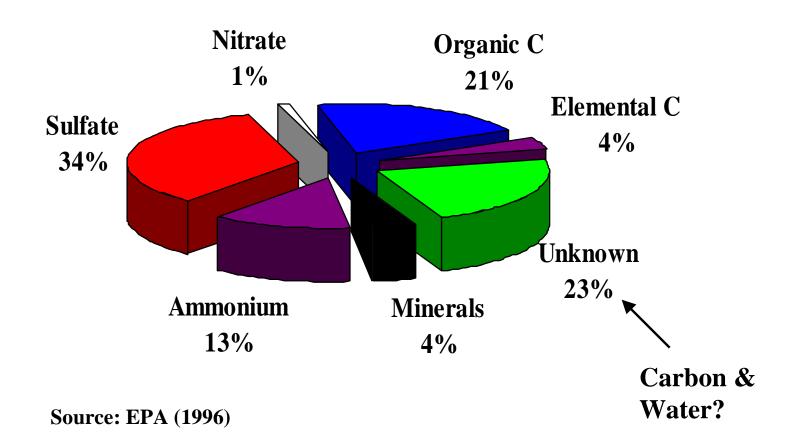
Coal-based power systems contribute to PM

- Primary particles and precursors (SO₂, NO_x)
- -SIPs will likely restrict emissions from coal power plants



Eastern PM_{2.5} Mass Apportionment

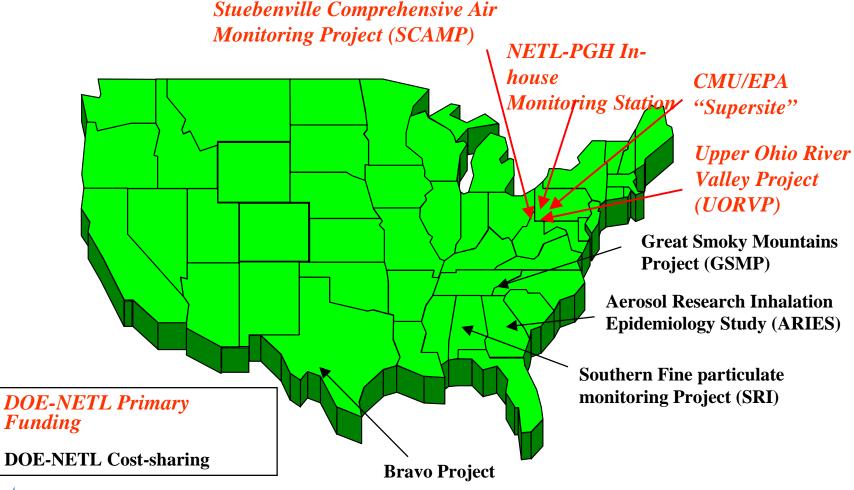
Current Understanding?



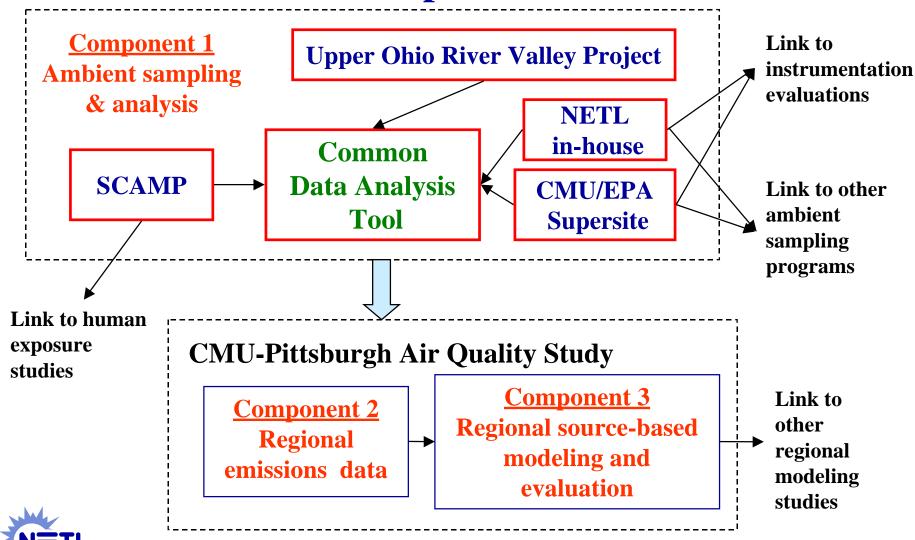


Ambient Sampling and Analysis

Current Project Portfolio



Integration of NETL PM_{2.5} Program Components



NETL's Ambient Air Monitoring Facility





NETL's ambient air monitoring equipment

PM_{2.5} Partisol®- Plus FRM Sequential Air Sampler (R&P),

ENVIROcheck Model 107M Environmental Particulate Monitoring System (Grimm),

PM_{2.5} DustTrack Aerosol Monitor (TSI),

PM_{2.5} TEOM® Ambient Particulate Monitor equipped with an AccuSampler (R&P),

PM_{2.5} RAAS 2.5-400 Speciation Sampler (Andersen),

PAS 2000 Real-time PAH Monitor (EcoChem Analytics),

Seven Day Pollen and Mold Spore Trap (Burkard),

Continuous Gas Monitors -- SO_2 , O_3 , CO, NO_X , NO_Y , NH_3 , H_2S (API),

PM_{2.5} PC-BOSS Sampler (BYU),

High Volume Samplers (BYU and NETL),

PM_{2.5} 5400 Ambient Carbon Particulate Monitor (R&P),

Highly Instrumented Meteorological Tower (Climatronics),

NETL's ambient air monitoring equipment "NEW"

PM_{2.5} 8400N Continuous Nitrate Analyzer (R&P),

PM_{2.5} 8400S Continuous Sulfate Analyzer (R&P),

ELPI- Real-time Particle Size Distribution and Concentration Measurement System (Dekati),

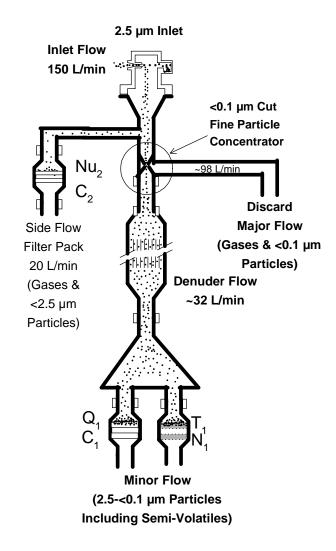
Sir Galahad II Ambient Vapor Phase Mercury Analyser (PS Analytical) and,

PM_{2.5} RTAA-1000 Seven Channel Aethalometer (Andersen).



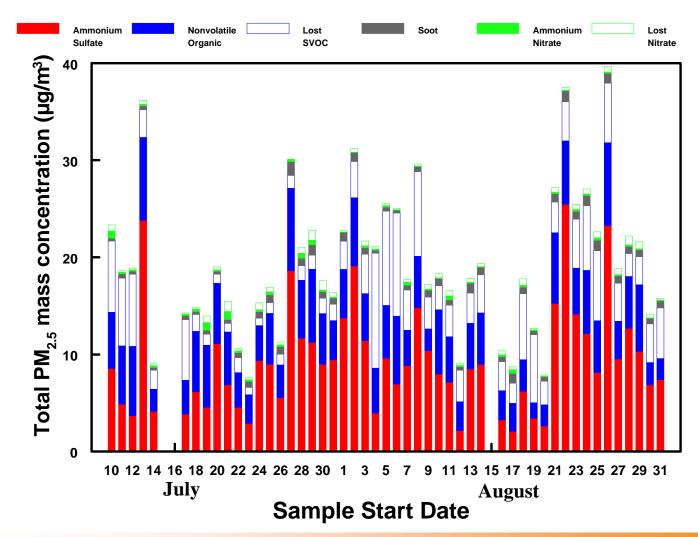
BYU PC-BOSS



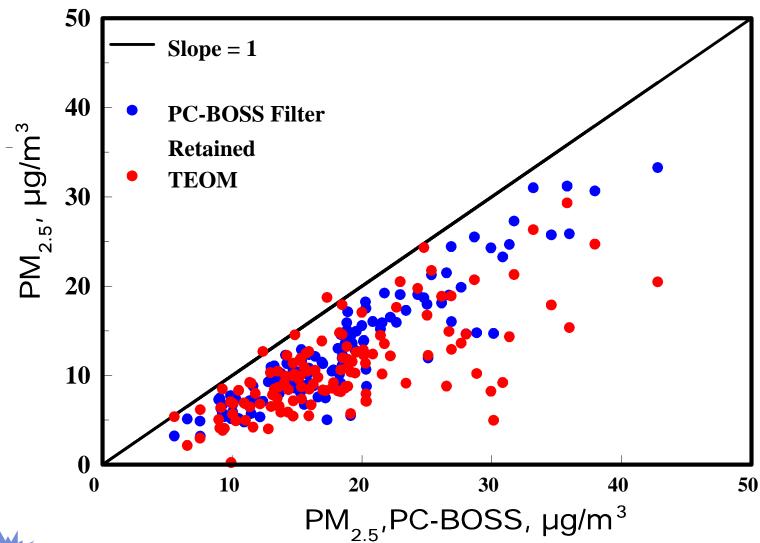




PM_{2.5} Composition - Summer 2000

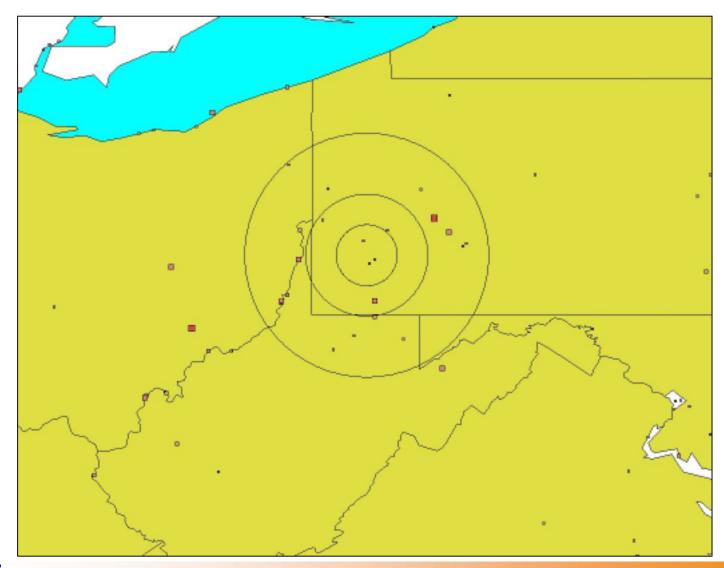








Regional Power Plant SO₂ Emissions





TEOM Sampling Sites



New Albany OH (NA) Athens OH (AT)

Stuebenville OH (ST) Holbrook PA (HB)

Hazelwood PA (*HW,10*) Kittanning PA (*KI*)

Greensburg PA (*GB,10*) Liberty PA (*LI*)

Flag Plaza in Pittsburgh PA(FP, 10)

National Energy Technology Laboratory PA (**NETL**)



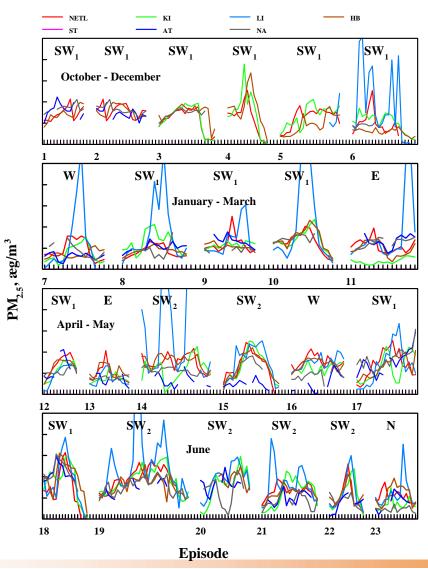


Regional Nature of High PM_{2.5} at NETL

- PM_{2.5} is generally less than 15 μg/m³ at the NETL monitoring site
- Episodes of high PM_{2.5} are generally short but can reach 50 μg/m³
- During PM_{2.5} episodes, high concentrations are seen at all sites, suggesting a regional source for the PM_{2.5}
- Concentrations of PM_{2.5} during episodes and episode frequency are both higher during the summer than during the winter

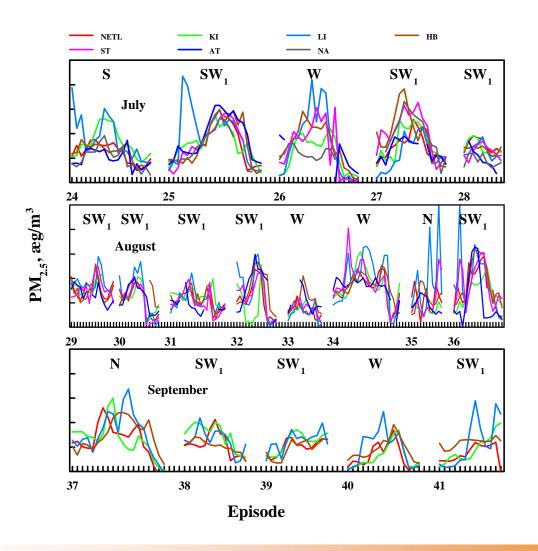


Regional Episodes

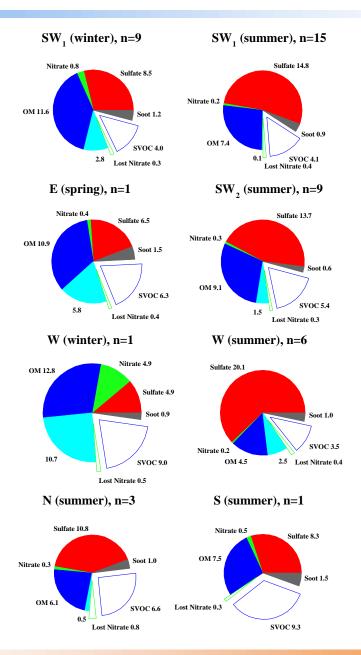




Regional Episodes - Continued









Conclusions

- PM_{2.5} concentration and composition has been measured for the last two years at NETL
- High PM_{2.5} at NETL is associated with high regional PM_{2.5} episodes of short duration
- Regional PM_{2.5} concentrations are generally higher in the summer than in the winter
- During the winter, high regional PM_{2.5} is dominated by organic material
- During the summer, high regional PM_{2.5} is dominated by ammonium sulfate
- Episodes of high PM_{2.5} are most often associated with transport from the southwest



Acknowledgments

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